CLAIMS

1. In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined shapes each characterized by characteristic data, a method for determining which of the shapes are intersected by the ray, the method comprising:

defining a reference object relative to the represented object;

determining the positions of the shapes relative to the reference object using the characteristic data; and

determining, on the basis of the positions of the shapes relative to the reference object, those shapes that have no chance of intersecting the ray, and those remaining shapes that may intersect the ray.

2. The method of claim 1 further comprising using a predetermined algorithm to determine which one of those remaining shapes intersects the ray.

3. The method of claim 1, wherein the collection of shapes comprises at least one polygonal shape.

4. The method of claim 1, wherein the collection of shapes comprises a plurality of polygonal shapes.

5. The method of claim 1, wherein the collection of shapes comprises at least one triangle.

6. The method of claim 1, wherein the collection of shapes comprises a plurality of triangles.

7. The method of claim 1, wherein the collection of shapes comprises a triangle mesh.

8. The method of claim 1, wherein the collection of shapes comprises a triangle strip.

9. The method of claim 1, wherein the collection of shapes comprises a triangle fan.

10. The method of claim 1, wherein said reference object comprises at least one plane.

11. The method of claim 1, wherein said reference object comprises a plurality of planes each of which contain the ray.

12. The method of claim 1, wherein said determining the positions of the shapes comprises determining positional aspects of sub-components of individual ones of the shapes to provide the characteristic data.

13. The method of claim 12, wherein the individual shapes comprise polygons and the sub-components comprise vertices that define the polygons, said determining the positions of the shapes comprising computing the positions of the vertices relative to the reference object.

14. The method of claim 13, wherein the reference object comprises a plane.

15. The method of claim 14, wherein the plane is parallel to one of the *x*, *y*, and *z* axes.

16. In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined shapes, a method for determining which of the shapes are intersected by the ray, the method comprising:

defining a collection of polygons that approximate an object, individual polygons having a plurality of vertices;

casting a ray toward the approximated object;

defining a reference object relative to the collection of polygons and that contains the cast ray;

pre-characterizing at least some vertices of at least some of the polygons to provide characteristic data that describes the vertices' positions relative to the reference object; and

using the characteristic data to ascertain the positions of the individual polygons relative to the reference object.

17. The method of claim 16, wherein the collection of polygons approximate the surface of the object.

18. The method of claim 16, wherein the individual polygons have a similar geometry.

19. The method of claim 16, wherein the individual polygons comprise triangles.

20. The method of claim 16, wherein the collection of polygons has a plurality of faces and a plurality of vertices, said faces outnumbering said vertices.

21. The method of claim 16, wherein at least two of said polygons share at least one side.

22. The method of claim 16, wherein at least two of said polygons share at least one vertex.

23. The method of claim 16, wherein none of said polygons share a vertex.

24. The method of claim 16, wherein said using of the characteristic data comprises determining whether an individual polygon is in a sub-set of polygons that might be intersected by the ray.

25. The method of claim 16, wherein said using of the characteristic data comprises determining whether an individual polygon is in a sub-set of polygons at least some of which straddle the reference object.

26. The method of claim 16, wherein said using of the characteristic data comprises determining whether an individual polygon is in a sub-set of polygons at least some of which straddle the reference object, and further comprising evaluating the sub-set of polygons to determine which polygons are intersected by the ray.

27. In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined shapes, a method for determining which of the shapes are intersected by the ray, the method comprising:

defining a plurality of triangles that approximate an object, individual triangles having three vertices;

casting a ray toward the approximated object;

defining at least one plane relative to the approximated object to contain the ray;

pre-characterizing the vertices of the plurality of triangles to provide characteristic data that describes the positions of the vertices relative to said at least one plane; and

using the characteristic data to ascertain the positions of the individual triangles relative to said at least one plane.

28. The method of claim 27, wherein said defining of said plurality of triangles comprises defining a triangle mesh.

29. The method of claim 27, wherein said defining of said plurality of triangles comprises defining a triangle fan.

30. The method of claim 27, wherein said defining of said plurality of triangles comprises defining a triangle strip.

31. The method of claim 27, wherein said using of the characteristic data comprises determining whether a particular individual triangle has a chance of being intersected by the ray.

32. The method of claim 27, wherein said using of the characteristic data comprises determining whether a particular individual triangle straddles said at least one plane.

33. The method of claim 27, wherein said using of the characteristic data comprises defining a sub-set of triangles at least some of which straddle the plane, and further comprising evaluating the sub-set of triangles to ascertain which triangles are intersected by the ray.

34. The method of claim 27, wherein none of the triangles share any vertices.

35. The method of claim 27, wherein all of the triangles share at least one vertex with another of the triangles.

36. The method of claim 27, wherein said defining of said at least one plane comprises defining a plane to be parallel to one of the *x, y,* or *z* axes.

37. In a computer graphic processing system in which a ray is cast toward an object represented by a collection of pre-determined polygons, a method for determining which of the polygons are intersected by the ray, the method comprising:

defining a sub-set of polygons from a collection of polygons that approximate an object by determining which polygons have vertices that satisfy a predefined relationship relative to a reference object; and

evaluating the sub-set of polygons to ascertain which of the polygons is intersected by a cast ray.

38. The method of claim 37, wherein the reference object comprises a plane.

39. The method of claim 37, wherein the reference object comprises multiple planes.

40. The method of claim 37, wherein the reference object comprises a plane, and said determining comprises determining which polygons straddle the plane.

41. One or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, implement the method of claim 37.

42. A programmable computer having a memory and a processor, the memory containing software code which causes the processor to execute the method of claim 37.

43. A computer graphic processing system comprising a programmable computer programmed with computer-readable instructions which, when executed by the programmable computer, implement the following method:

defining a plurality of polygons that approximate an object, individual polygons having a plurality of vertices;

casting a ray toward the approximated object;

defining at least one plane relative to the approximated object to contain the ray;

pre-characterizing the vertices of the plurality of polygons to provide characteristic data that describes the positions of the vertices relative to said at least one plane;

using the characteristic data to ascertain the positions of the individual polygons relative to said at least one plane;

determining which of the individual polygons might be intersected by the ray, based upon their ascertained positions, to provide a sub-set of polygons; and

evaluating the sub-set of polygons to ascertain which of the polygons are intersected by the ray.

44. The computer graphic processing system of claim 43, wherein said defining of the plurality of polygons comprises defining a polygon mesh.

45. The computer graphic processing system of claim 43, wherein said defining of the plurality of polygons comprises defining a polygon fan.

46. The computer graphic processing system of claim 43, wherein said defining of the plurality of polygons comprises defining a polygon strip.

47. The computer graphic processing system of claim 43, wherein said defining of said at least one plane comprises defining said plane to be parallel to one of the *x, y,* and *z* axes.

48. One or more computer-readable media having computer-readable instructions thereon which, when executed by a computer graphic processing system, implement the following method:

defining a plurality of triangles that approximate an object, individual triangles having three vertices;

casting a ray toward the approximated object;

defining at least one plane relative to the approximated object to contain the ray;

pre-characterizing the vertices of the plurality of triangles to provide characteristic data that describes the positions of the vertices relative to said at least one plane;

using the characteristic data to ascertain the positions of the individual triangles relative to said at least one plane;

determining which of the individual triangles might be intersected by the ray, based upon their ascertained positions, to provide a sub-set of triangles; and

evaluating the sub-set of triangles to ascertain which of the triangles are intersected by the ray.

49. The one or more computer-readable media of claim 48, wherein said defining of the plurality of triangles comprises defining one of a triangle mesh, a triangle strip, and a triangle fan.

50. A computer graphic processing system comprising:

a processor;

memory; and

software code stored in the memory that causes the processor to implement a ray-intersection algorithm which:

casts a ray at a collection of shapes that approximate an object;

defines a reference object that contains the ray;

pre-characterizes aspects of individual ones of the shapes of the collection to provide characteristic data; and

uses the characteristic data to ascertain the position of the shapes of the collection of shapes relative to the reference object.

51. The computer graphic processing system of claim 50, wherein the ray intersection algorithm casts a ray at a collection of polygons, each of which have similar geometries.

52. The computer graphic processing system of claim 50, wherein the ray intersection algorithm casts a ray at a collection of triangles.

53. The computer graphic processing system of claim 52, wherein the collection of triangles defines a triangle mesh.

54. The computer graphic processing system of claim 50, wherein the ray intersection algorithm pre-characterizes aspects of the shapes by computing positions of various sub-components of the shapes relative to the reference object.

55. The computer graphic processing system of claim 54, wherein the reference object comprises at least one plane.

56. The computer graphic processing system of claim 55, wherein the shapes comprise polygons and the sub-components comprise vertices of the polygons.